

## INTEGRATED MANAGEMENT OF POWDERY MILDEW DISEASE OF CORIANDER CAUSED BY *Erysiphe polygoni* DC

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### ABSTRACT

*Powdery mildew is a major constraint for the low productivity of the coriander. Various fungicides and bio-control agents were evaluated for the management of powdery mildew on coriander (Coriandrum sativum L.) as field trial. The results showed that all the treatments were found effective against the disease and significantly reduced the powdery mildew intensity and thereby increased the seed yield, number of seeds per umbel and oil content in coriander over unsprayed control. However, among fungicides, hexaconazole (0.05%), wettable sulphur (0.30%), dinocap (0.1%) and penconazole (0.05%) and among bioagent, Pseudomonas fluorescens (3g) were found highly effective for controlling the disease with better seed yield and oil content.*

**KEY WORDS:** Bio-control agents, coriander, fungicides, powdery mildew

### INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an important spice crop which is gaining more popularity among the growers of Gujarat. It is commonly known as “Dhana”, belonging to family Apiaceae, and occupies a prime position among different seed spices. However, the major constraints for low productivity are several biotic diseases including powdery mildew. It is an important disease caused by *Erysiphe polygoni* DC (Dange *et al.*, 1992). It is also wide spread in distribution and appears in devastating form every year. It causes losses up to 15-40 per cent, in addition to considerable loss in quality of coriander seeds (Srivastava *et al.*, 1971). The severity of the disease has increased in recent years due to

changing in production practices, especially due to use of high yielding late maturing varieties in new environments (Singh, 2006). For this, the fungicides and bio-control agents are the only option available at present. As the disease intensity is increasing every year and causing severe loss in the coriander crops. Therefore, it has become necessary to manage to disease in time. Keeping in view the facts, the present study was undertaken to find out more effective and economical treatments to combat the powdery mildew disease on coriander. Various fungicide and bio-control agents were evaluated as field trial.

### MATERIALS AND METHODS

An experiment was laid out in a randomized block design with three replications. The cultivar GC 2 of

coriander was sown in 4.50 m × 3.00 m plots during winter season of 2013. Land preparation was done after initial application of decomposed FYM and recommended doses of NPK were applied. Seed were sown in the field with spacing of 30 cm between rows. The treatments were: seed treatment with biocontrol agents viz., *Pseudomonas fluorescens* (3g), *Bacillus subtilis* (2g) and *Trichoderma viride* (3g) and spraying of fungicides viz., Penconazole (0.05%), Hexaconazole (0.05%), Pyraclostrobin (0.05%), Wettable sulphur (0.30%), Dinocap (0.10%) and Mancozeb (0.20%) along with Control-I (Water spray) and Control-II (Without water spray). Seed treatment of various bioagents was made at a time of sowing and two sprays of fungicides were given, first at the time of first appearance of disease symptoms and second spray was given 15 days after the first spray. The observations on the disease intensity was recorded 10 days after second spray from 25 randomly selected plants in each plot using 0-5 scale as: 0 = healthy / no incidence; 1 = whitish small spots on leaf; 2 = > 50 per cent leaves covered with whitish growth; 3 = > 50 per cent leaves, umbels/branches covered with whitish growth; 4 = > 50 per cent leaves, umbels/branches and seed covered with whitish growth; and 5 = Plant completely covered with whitish growth. Based on these observations, per cent disease intensity (PDI) of the disease was worked out. The seed yield, number of seeds per umbel and volatile oil percentage were recorded from individual plots. The yield was converted into per hectare basis.

## RESULTS AND DISCUSSION

### *Effect of fungicides and bio-control agents on per cent disease intensity and seed yield*

Data presented in Table 1 revealed that all fungicides and biological agents tested significantly reduced the disease intensity with increased seed yield as compared to control (Without water spray). However, the treatment with two sprays of hexaconazole (0.05 %) was found promising for getting higher yield (1257.34 kg/ha), which was 51.51 per cent higher than control (Without water spray). with 22.53 per cent less disease intensity. It was found at par with wettable sulphur (0.30%) and dinocap (0.10%) treatments with 24.17 and 29.83 per cent disease intensity and 1243.86 and 1106.58 kg/ha seed yield. Among biological agent, *Pseudomonas fluorescens* (3 g) was found next to fungicides in reducing per cent disease intensity which was 47.70 per cent with 30.17 per cent reduction in disease intensity with 911.81 kg/ha seed yield with 33.14 per cent increase over control (Without water spray) followed by *Trichoderma viride* (3 g). From the results, it was cleared that efficacy of all the treatments except control (Without water spray) recorded better performance in reducing the disease intensity with corresponding increase in seed yield. The maximum per cent disease intensity was recorded in control (Without water spray) (68.31 %) with minimum seed yield (609.67 kg/ha).

Similar results were reported by Singh (2006), who reported 82.08 per cent reduction of powdery mildew intensity and 65.88 per cent increase in coriander yield by three sprays of hexaconazole (0.1 %) and propiconazole (0.1 %). Patel *et al.* (2006a) reported minimum per cent disease intensity of powdery mildew in coriander by seed treatment plus soil application of tridemorph (35.80 %), which was at par with the spray of wettable sulphur (39.80 %). Patel *et al.*

(2008) found that wettable sulphure was superior over untreated control in controlling powdery mildew of coriander. Single foliar application with wettable sulphur (0.2 %) at 60 days after sowing also reduced disease incidence and increase yield. Surwase *et al.* (2009) observed fungicides hexaconazole (0.05%) and penconazole (0.05%); botanical NSKE (5%) and bio-agents *Trichoderma harzianum* (0.5%) were highly effective for controlling the powdery mildew disease intensity viz., 70.46, 68.45, 52.79 and 55.00 per cent and gave better seed yield viz., 721, 710, 595, and 623 kg/ ha, respectively. Akbari and Parakhia (2010), who documented that powdery mildew of coriander was effectively controlled by three dustings of elemental sulphur @ 25 kg per ha or spray of dinocap 0.05 per cent thrice.

**Effect of fungicides and biological agents on number of seeds per umbel and volatile oil**

Data presented in Table 2 clearly indicated that all treatments significantly increased the number of seeds per umbel and volatile oil in coriander. The maximum numbers of seeds per umbel (31.82) were recorded in hexaconazole (0.05 %), whereas the maximum volatile oil 0.294 per cent was found in wettable sulphur (0.3 %) as compared to control (Without water spray). In biological agent, *Pseudomonas fluorescens* (3 g) was found better with 29.24 of seeds per umbel and 0.246 per cent volatile oil. Patel (2011) reported difenaconazole (0.05 %) and wettable sulphur (0.2 %) most effective fungicides for reducing powdery mildew with increase seed yield and volatile oil of cumin.

**CONCLUSION**

From the results, it can be concluded that among fungicides, hexaconazole (0.05%), wettable sulphur (0.30%), dinocap (0.1%) and

penconazole (0.05%) and among bioagent, *Pseudomonas fluorescens* (3g) were found highly effective for controlling the disease with better seed yield and oil content.

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**Table 1: Effects of different fungicides and bio-control agents on intensity of powdery mildew disease and yield of coriander**

| Sr. No.      | Treatments                       | Concen. (%) | PDI               | Per Cent Decrease in PDI | Yield (kg/ha) | Per Cent Increase in Yield |
|--------------|----------------------------------|-------------|-------------------|--------------------------|---------------|----------------------------|
| 1            | Penconazole                      | 0.05        | 35.71*<br>(34.07) | 50.12                    | 1082.14       | 43.66                      |
| 2            | Hexaconazole                     | 0.05        | 28.34<br>(22.53)  | 67.01                    | 1257.34       | 51.51                      |
| 3            | Pyraclostrobin                   | 0.05        | 39.14<br>(39.85)  | 41.66                    | 979.60        | 37.73                      |
| 4            | Wettable sulphur                 | 0.30        | 29.45<br>(24.17)  | 64.62                    | 1243.86       | 50.98                      |
| 5            | Dinocap                          | 0.10        | 33.10<br>(29.83)  | 56.33                    | 1106.58       | 44.90                      |
| 6            | Mancozeb                         | 0.20        | 41.10<br>(43.21)  | 36.74                    | 868.75        | 29.82                      |
| 7            | <i>Pseudomonas fluorescens</i>   | 3.00 g      | 43.68<br>(47.70)  | 30.17                    | 911.81        | 33.14                      |
| 8            | <i>Bacillus subtilis</i>         | 2.00 g      | 49.99<br>(58.67)  | 14.11                    | 788.67        | 22.70                      |
| 9            | <i>Trichoderma viride</i>        | 3.00 g      | 48.64<br>(56.33)  | 17.54                    | 835.57        | 27.00                      |
| 10           | Control-I (Water spray)          | 0.00        | 53.96<br>(65.38)  | 4.29                     | 668.73        | 8.83                       |
| 11           | Control-II (Without water spray) | 0.00        | 55.74<br>(68.31)  | -                        | 609.67        | -                          |
| S. Em. $\pm$ |                                  |             | 1.79              |                          | 49.98         |                            |
| C.D. at 5%   |                                  |             | 5.30              |                          | 147.43        |                            |
| C. V. %      |                                  |             | 7.74              |                          | 9.19          |                            |

\*Arc-sin transformed values

Values in parenthesis are original values

**Table 2: Effect of different fungicides and biological agents on number of seeds per umbel and volatile oil of coriander**

| Sr. No. | Treatments                       | Concen. (%) | *No. of seeds / Umbel | **Volatile oil (%) |
|---------|----------------------------------|-------------|-----------------------|--------------------|
| 1       | Penconazole                      | 0.05        | 30.61                 | 0.277              |
| 2       | Hexaconazole                     | 0.05        | 31.82                 | 0.291              |
| 3       | Pyraclostrobin                   | 0.05        | 30.24                 | 0.254              |
| 4       | Wettable sulphur                 | 0.30        | 31.76                 | 0.294              |
| 5       | Dinocap                          | 0.10        | 30.89                 | 0.287              |
| 6       | Mancozeb                         | 0.20        | 30.08                 | 0.242              |
| 7       | <i>Pseudomonas fluorescens</i>   | 3.00 g      | 29.94                 | 0.246              |
| 8       | <i>Bacillus subtilis</i>         | 2.00 g      | 29.86                 | 0.231              |
| 9       | <i>Trichoderma viride</i>        | 3.00 g      | 29.91                 | 0.234              |
| 10      | Control-I (Water spray)          | 0.00        | 29.78                 | 0.228              |
| 11      | Control-II (Without Water spray) | 0.00        | 28.91                 | 0.227              |

\*Average of 50 umbels \*\*Average of 100 g seeds

[MS received: February 09, 2017]

[MS accepted: March 02, 2017]